

4,5,6,7-tetrahydroindenyltitanium trichloride, 1-methyl-2-ethyl-4,5,6,7-tetrahydroindenyltitaniumtrimethyl, 1-methyl-2-ethyl-4,5,6,7-tetrahydroindenyltitanium trimethoxide, 1-methyl-2-ethyl-4,5,6,7-tetrahydroindenyltitaniumtribenzyl, 1,3-dimethyl-2-ethyl-4,5,6,7-tetrahydroindenyltitanium trichloride, 1,3-dimethyl-2-ethyl-4,5,6,7-tetrahydroindenyltitaniumtrimethyl, 1,3-dimethyl-2-ethyl-4,5,6,7-tetrahydroindenyltitanium trimethoxide, 1,3-dimethyl-2-ethyl-4,5,6,7-tetrahydroindenyltitaniumtribenzyl, 1,2,3,4-tetrahydrofluorenyltitanium trichloride, 1,2,3,4-tetrahydrofluorenyltitaniumtrimethyl, 1,2,3,4-tetrahydrofluorenyltitanium trimethoxide, 1,2,3,4-tetrahydrofluorenyltitaniumtribenzyl, 9-methyl-1,2,3,4-tetrahydrofluorenyltitanium trichloride, 9-methyl-1,2,3,4-tetrahydrofluorenyltitaniumtrimethyl, 9-methyl-1,2,3,4-tetrahydrofluorenyltitanium trimethoxide, 9-methyl-1,2,3,4-tetrahydrofluorenyltitaniumtribenzyl, 9-ethyl-1,2,3,4-tetrahydrofluorenyltitanium trichloride, 9-ethyl-1,2,3,4-tetrahydrofluorenyltitaniumtrimethyl, 9-ethyl-1,2,3,4-tetrahydrofluorenyltitanium trimethoxide, 9-ethyl-1,2,3,4-tetrahydrofluorenyltitaniumtribenzyl, 1,2,3,4,5,6,7,8-octahydrofluorenyltitanium trichloride, 1,2,3,4,5,6,7,8-octahydrofluorenyltitaniumtrimethyl,

1,2,3,4,5,6,7,8-octahydrofluorenyltitanium trimethoxide,
1,2,3,4,5,6,7,8-octahydrofluorenyltitaniumtribenzyl, 9-
methyl-1,2,3,4,5,6,7,8-octahydrofluorenyltitanium
trichloride, 9-methyl-1,2,3,4,5,6,7,8-
octahydrofluorenyltitaniumtrimethyl, 9-methyl-
1,2,3,4,5,6,7,8-octahydrofluorenyltitanium trimethoxide,
9-ethyl-1,2,3,4,5,6,7,8-octahydrofluorenyltitanium
trichloride, 9-ethyl-1,2,3,4,5,6,7,8-
octahydrofluorenyltitaniumtrimethyl, 9-ethyl-
1,2,3,4,5,6,7,8-octahydrofluorenyltitanium trimethoxide,
9-ethyl-1,2,3,4,5,6,7,8-
octahydrofluorenyltitaniumtribenzyl, etc.; as well as their
derivatives to be produced by substituting the titanium element
in those compounds with zirconium or hafnium, or with any other
element of different Groups, and also their analogues having
a transition metal element of lanthanides. However, these
are not limitative.

(III) Specific Examples of the transition metal
compounds of formula (5) include tetramethyltitanium,
tetrabenzyltitanium, tetraethyltitanium,
tetraphenyltitanium, tetramethoxytitanium,
tetraethoxytitanium, tetrephenoxytitanium,
tetra(dimethylamino)titanium, tetra(diethylamino)titanium,
tetra(diphenylamino)titanium; bis(phenoxy)titanium
compounds described in Macromolecules, 1997, 30, 1562-1569,

in Journal of Organometallic Chemistry, 514 (1996), 213-217, etc.; diamidotitanium compounds described in Macromolecules, 1996, 29, 5241-5243, in Organometallics, 1997, 16, 1491-1496, etc.; their derivatives to be produced by substituting the titanium element in those compounds with zirconium or hafnium, or with any other element of different Groups, and also their analogues having a transition metal element of lanthanides.

(IV) In the transition metal compounds of formula (6), M^2 represents a transition metal of Groups 8 to 10 of the Periodic Table, concretely including iron, cobalt, nickel, palladium, platinum, etc. Of those, preferred are nickel and palladium. L^1 and L^2 each represents a coordination-bonding ligand; and X^1 and Y^1 each represent a covalent-bonding or ionic-bonding ligand. As mentioned hereinabove, X^1 and Y^1 include, for example, a hydrogen atom, a halogen atom, a hydrocarbon group having from 1 to 20, preferably from 1 to 10 carbon atoms, an alkoxy group having from 1 to 20, preferably from 1 to 10 carbon atoms, an amino group, a phosphorus-containing hydrocarbon group having from 1 to 20, preferably from 1 to 12 carbon atoms (e.g., a diphenylphosphine group, etc.), a silicon-containing hydrocarbon group having from 1 to 20, preferably from 1 to 12 carbon atoms (e.g., a trimethylsilyl group, etc.), and a boron compound residue having a hydrocarbon group with from 1 to 20, preferably from 1 to 12 carbon atoms or having halogens (e.g., $B(C_6H_5)_4$, BF_4).